HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Voights Creek Fall Chinook Fingerling Program
Species or Hatchery Stock:	Fall Chinook (Onchorynchus tshawytscha) Puyallup River
Agency/Operator:	Washington Department of Fish and Wildlife
Watershed and Region:	Puyallup River Puget Sound
Date Submitted:	, 2002
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SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Voights Creek Hatchery Fall Chinook Fingerling Program

1.2) Species and population (or stock) under propagation, and ESA status.

Puyallup River Fall Chinook (*Onchorynchus tshawytscha*)

1.3) Responsible organization and individuals

Name (and title):	Chuck Johnson, Operations Manager	
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

In addition to WDFW's Voights Creek Hatchery production, chinook are transferred to the Puyallup Tribe's facility on Diru Creek. Also, eyed eggs are provided to the South Puget Sound Regional Fisheries Enhancement Group and local schools for rearing and release. Surplus hatchery adult chinook (goal of 1,000 per year) are provided to the Puyallup Tribe to reintroduce chinook above Electron Dam in the upper Puyallup watershed.

1.4) Funding source, staffing level, and annual hatchery program operational costs.

Funding is provided through the State General Fund.

1.5) Location(s) of hatchery and associated facilities.

Voights Creek Hatchery is located at RM 0.5 on Voights Creek (10.0414), a tributary of the Carbon River (10.0413). Voights Creek enters the Carbon River at RM 4. The Carbon River is a tributary to the Puyallup River (10.0021) and joins it at RM 17.8.

1.6) Type of program.

A. Voights Creek fingerling releases: Integrated Harvest program

B. Upper Puyallup River Adult releases: Integrated Harvest program

1.7) Purpose (Goal) of program.

A. Augmentation: The goal of this program is to provide harvest opportunity. Presently, all fish are mass marked (adipose-fin clip only) to provide data on the NOR/HOR spawning ground ratios.

B. Restoration: The goal of this program is to reintroduce the closest "local" chinook stock above Electron Dam on the upper Puyallup River as adults become available at Voights Creek.

1.8) Justification for the program.

A. This program will be operated to provide fish for harvest while minimizing adverse genetic, demographic or ecological effects on listed fish. This will be accomplished in the following manner:

1) Juvenile chinook will be released as smolts to minimize emigration time to saltwater thereby minimizing potential competition with and predation on natural-origin listed fish.

2) All juvenile chinook released will be acclimated at a hatchery facility potentially capable of trapping the vast majority of returning adults. Currently, the weir at this facility is only marginally functional and fish must voluntarily enter the hatchery pond. WDFW has requested funding to rebuild the adult trap and holding pond to maximize trapping efficiency and minimize straying and make possible the removal of hatchery fish from the naturally spawning population.

3) All juvenile chinook will be mass marked with an adipose fin clip to distinguish them from wild or naturally spawning chinook (mass-marking is dependent upon annual agreement with the co-managers).

4) Adult chinook produced from this program will be harvested at a rate that allows adequate escapement of listed chinook .

B. Utilize hatchery surplus adults to reintroduce chinook into habitat devoid of salmon for over 90 years.

1.9) List of program “Performance Standards”.

1.10) List of program “Performance Indicators”, designated by "benefits" and "risks."

Performance Standards and Indicators for Puget Sound **Integrated Harvest** Chinook programs.

Performance Standard	Performance Indicator	Monitoring and Evaluation Plan
Produce adult fish for harvest	Survival and contribution rates	Monitor catch and measure survivals using CWT data.
Meet hatchery production goals	Number of juvenile fish released -**1,600,000**	Estimating number of fish planted (weighing / counting fish), monitoring proximity to hatchery production goals, number released recorded on hatchery divisions "plant reports", data available on WDFW data base. Future Brood Documents.
Manage for adequate escapement	Hatchery and wild return rates	Monitoring hatchery/wild return rates through trapping (at the hatchery or at weir), redd and snorkel surveys on the spawning grounds plus catch records.

Minimize interactions with listed fish through proper broodstock management	Total number of broodstock collected - **1,110 adults**	Measuring number of fish actually spawned and killed to meet egg take goal at the hatchery. Hatchery Records.
	Sex ratios	Hatchery Records, Spawning Guidelines
	Timing of adult collection/spawning - **August to mid/late October**	Start trapping prior to historical start of the run, continue trapping throughout the run, dates and times are recorded on hatchery divisions "adult reports", data available on WDFW data base.
	Number of listed fish passed upstream - **1,000 above the Electron Dam**	
	Hatchery stray rate	CWT data and spawning ground surveys
	Number wild fish used in broodstock - **unknown**	Hatchery records
	Return timing of hatchery / wild adults - **August to mid/late October**	Hatchery records
	Adherence to spawning guidelines - **1:1 with the use of a backup male, if needed**	Hatchery records Spawning Guidelines

Minimize interactions with listed fish through proper rearing and release strategies	Juveniles released as smolts	Future Brood document and Hatchery records Hatchery records and historical natural out-migrant data
	Outmigration timing of listed fish / hatchery fish **being determined/mid-May to early June**	FBD and Hatchery records
	Size and time of release **80 fpp/mid-May to early June**	CWT data and mark / unmarked ratios of adults
Maintain stock integrity and genetic diversity	Effective population size	Spawning Guidelines
	Hatchery-Origin Recruit spawners	Spawning ground surveys
Maximize in-hatchery survival of broodstock and their progeny; and Limit the impact of pathogens associated with hatchery stocks, on listed fish	Fish pathologists will monitor the health of hatchery stocks on a monthly basis and recommend preventative actions / strategies to maintain fish health	Co-Managers Disease Policy Fish Health monitoring records
	Fish pathologists will diagnose fish health problems and minimize their impact	
	Vaccines will be administered when appropriate to protect fish health	

	A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings	
	Fish health staff will present workshops on fish health issues to provide continuing education to hatchery staff.	
Ensure hatchery operations comply with state and federal water quality standards through proper environmental monitoring	NPDES compliance	Monthly NPDES records

1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

5 year (1988-92) average is 1,237. Range is 725 - 1,644.
Goal is approximately 1,110 adults assuming 4,800 eggs per female.

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling	Voights' Creek	1,600,000
Yearling		

Note: Surplus adults will be transferred into the upper Puyallup River, above Electron Dam, to re-introduce chinook into the watershed. The transfer goal is 1,000 fish at this time. Also, transfer 400,000 fish to the Puyallup tribal facility on Diru Creek.

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

There is no recent data available because these fish have not been coded-wire tagged in the recent past. The 1997 brood releases included 200,000 adipose-fin clipped/coded-wire tagged fish to measure survival and stray rates of this program. Broodstock levels back to the hatchery rack for broodyears 1995 through 2001 were 2,133, 3,179, 3,637, 3,544, 3,948, 1,614 and 2,647, respectively.

1.13) Date program started (years in operation), or is expected to start.

A. Voights Creek hatchery went into operation in 1917.

B. First adult introduction above Electron Dam (450 fish) began in 1999.

1.14) Expected duration of program.

A. Ongoing

B. Four brood years or until success of adult introduction can be assessed.

1.15) Watersheds targeted by program.

Puyallup watershed (10.0021-above the Electron diversion)
Voights Creek (10.0414)
Mowich River (10.0624)
Rushingwater Creek (10.0625)
Deer Creek (10.0685)

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

None

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

2.1) List all ESA permits or authorizations in hand for the hatchery program.

None

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.

- Identify the ESA-listed population(s) that will be directly affected by the program.

Puyallup River Fall Chinook.

Adults spawn in the mainstem Puyallup River from approximately RM 10.4 upstream to the Puget Sound Energy's Electron diversion facility (RM 41.7). Fall chinook spawning habitat is available in the Carbon River from its mouth up into Mt. Rainier National Park. Tributary spawning takes place in Clarks Creek, Fennel Creek, Canyon Falls Creek, South Prairie Creek, Wilkeson Creek and Kapowsin Creek. Approximately 75% of the fall chinook spawning currently takes place in the South Prairie Creek system. The mean ratio of chinook carcasses sampled on South Prairie Creek spawning grounds in return years 1993 through 1997 was 0.9% age 2, 14.6% age 3, 75.0% age 4, 9.5% age 5 and 0.1% age 6. The sex ratio of sampled carcasses in 1999 was 50.2% male and 49.8% female. In return years 1992 through 1997, age 3, 4, 5 and 6 adults averaged 71.6 cm., 83.0 cm., 89.9 cm., and 104 cm., respectively. Additional chinook spawning and rearing habitat is now available above the newly completed (in 2000) passage facility at the Electron Diversion Dam.

Naturally produced fall chinook may voluntarily stray into the hatchery holding pond and be incorporated into the hatchery broodstock. There currently is no functional weir on Voights Creek, but low flows during the fall chinook spawning period usually discourage spawning upstream of the hatchery facility. Voights Creek is a relatively small tributary to the Carbon River and is not typical fall chinook habitat. It is unlikely that significant numbers of natural fall chinook are encouraged to stray into this stream, much less the holding pond. The level of natural contribution to hatchery broodstock will be assessed when identified hatchery fish begin returning. However, that assessment may be confounded by returns resulting from hatchery-origin chinook spawning in Voights Creek below the hatchery.

Most naturally produced Puyallup River chinook migrate to salt water as zero age smolts after spending only a few months in freshwater. Only 1.2% of Puyallup River fall chinook scale samples from return years 1992 through 1997 exhibited a yearling life history pattern. Out-migration timing is not currently well defined, but a study was initiated in 2000 to determine juvenile production levels and migration timing. After a few weeks of estuarine acclimation, most juveniles begin moving to nearshore feeding grounds in Puget Sound and the Pacific Ocean. Sexually mature fish begin arriving back at the river mouth in late July and continue to enter the river until mid-October. The upstream migration peaks in late August to mid-September. Spawning begins in early September, peaks in early October and is generally complete by November.

Voights Creek production adults released above the Electron Diversion Dam ladder will not be directly impacting any component of naturally spawning Puyallup fall chinook. Any progeny resulting from successful spawning of those fish will compete with naturally produced smolts upon out-migration. If the progeny drop below the barrier to rear, they will compete with naturally produced fish for rearing resources in the upper Puyallup River, below the barrier.

- Identify the ESA-listed population(s) that may be <u>incidentally</u> affected by the

program.

White River Summer/Fall Chinook.

This stock was listed in SASSI, however, there was no stock characterization beyond a presumed October spawning time and no stock assessment data were listed.

White River Spring Chinook.

There is little age or size-at-age data for the White River Spring Chinook stock of fish. It is thought that most of these fish return at age 3 and 4, although it is expected that fish return to spawn as 2 to 5 year-old fish. Beginning with the 2000 return, scale samples were taken from fish trucked above Mud Mountain Dam from the Buckley trap in order to ascertain age composition of this spawning population. Sex ratios are hard to determine on early run chinook and spawning ground sampling has been limited by the number of carcasses available.

Adults spawn in the mainstem White River from the Puget Sound Energy project tailrace at Dieringer (river mile 3.5) up to the Puget Sound Energy diversion dam at river mile 24.3. Migrating adults are collected, at this point, in the Buckley trap and transported 12 miles upstream, above Mud Mountain Dam. Tributary spawning takes place in Boise Creek, below the diversion dam, and in the Greenwater River, Clearwater River, Huckleberry Creek and the West Fork White River, all above Mud Mountain Dam.

Past studies have shown that 80% of White River chinook are, atypically for spring chinook, zero age out-migrants. Limited scale analyses from early-returning chinook at the Buckley trap confirm that most naturally produced White River spring chinook out-migrate as subyearlings. Out-migration timing is not currently well defined for this stock, but a study was initiated in 2000 to determine juvenile production levels and migration timing. After a few weeks of estuarine acclimation, most juveniles begin moving to nearshore feeding grounds in Puget Sound and the Pacific Ocean. Sexually mature fish begin arriving back at the river mouth in May and enter the river through mid-September. Passage at the Buckley trap commences in late May or early June and ends in early October. Spawning takes place from early September through mid-October. These return and spawn timings are broader than those associated with most spring chinook stocks and there was some speculation that the latter part of the run may be a separate stock. Limited genetic analysis has shown no support for that contention, but additional samples are being taken from juveniles migrating out in 2000 for confirmation.

There is significant spatial separation between the production facility and the White River, which enters the Puyallup River approximately 7.5 river miles downstream of the Carbon River. White River spring chinook are genetically different from Puyallup fall chinook, however, there is a great deal of overlap in their juvenile migration timings, adult return and spawning timings. They are both predominantly zero age outmigrants.

Migrating hatchery program smolts may compete with natural-origin and hatchery

recovery program spring chinook fingerlings in the Puyallup river below the mouth of the White River and in the estuarine areas.

2.2.2) Status of ESA-listed salmonid population(s) affected by the program.

- Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds

Critical and viable population threshholds under ESA have not been determined, however, the SASSI report (WDFW) determined this population (Puyallup River Fall Chinook) status to be "unknown".

- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

There is no stock-specific data available to estimate survival or productivity of the natural Puyallup River fall chinook.

Washington run size is not estimated for White River spring chinook and coded-wire-tagging results have not yet provided the stock-specific harvest rate data necessary to calculate adult production rates.

- Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Estimates of Puyallup River fall chinook spawning naturally in the South Prairie Creek sub-basin[1]

1994	798
1995	1335
1996	1225
1997	622
1998	1028
1999	1422
2000	1193
2001	1915

[1.] Note that the historic Puyallup River fall chinook escapement estimates listed in Run Reconstruction are not considered accurate by the co-managers and are not relative to estimates made by a new method, beginning in 1999. The South Prairie Creek sub-basin has been chosen as an indicator of Puyallup River escapement, with a local spawning objective of 500 adults.

Numbers of adult White River spring chinook passed above Mud Mountain Dam[1] (From Army Corps of Engineers trucking records):

1988	127
1989	83
1990	275
1991	194
1992	406
1993	409
1994	392
1995	605
1996	628
1997	402
1998	320
1999	553
2000	1,523
2001	2,002

[1.] Note that there are currently no estimates made of spring chinook spawning below the Puget Sound Energy diversion dam at Buckley.

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

Puyallup River fall chinook - Unknown. There has been no identification of hatchery-origin fish in this basin until the 1997 brood. Ratios will be developed when these fish mature and return to spawn.

In South Prairie Creek, a spawning index tributary of the Carbon River, preliminary hatchery-origin ratios are available for the 1997 brood CWT group which were released from Voights' Creek. The CWT release was 200,000 fish of a hatchery total of ~ 1.6 million or 1:8 ratio. Marked adults are recorded during the routine spawner surveys.

Year	Fish Sampled	Marks Recovered	Source	Hor/Nor Ratio
1998	104	none	na	na
1999	220	1	Fox Island	1/220
2000	71	2	1 Voights'	8/71
			1 ad clip only	unknown
2001	94	2	2 Voights'	16/94

White River spring chinook - Unknown, although only unmarked, untagged fish are trucked above Mud Mountain Dam. This precludes identified hatchery-origin adults from being passed upstream, but unidentified hatchery-origin fish may be in the upper river natural spawning population. 1999 coded-wire-tag recoveries at the Buckley trap/White River Hatchery showed contributions of Skagit River spring chinook (released into

Tulalip Bay), Fox Island Net Pen fall chinook, Voights Creek fall chinook, South Sound Net Pen fall chinook, Elliott Bay Net Pen fall chinook, Diru Creek fall chinook and Hoodsport Hatchery fall chinook. All of these strays were removed from the spawning population, however, unmarked elements of these production units (and others) may have been incorporated into the local broodstock, both above and below the barrier.

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take.

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

Puyallup River fall chinook:
Naturally produced fall chinook may voluntarily stray into the hatchery holding pond and be incorporated into the hatchery broodstock. There currently is no functional weir on Voights Creek, but low flows during the fall chinook spawning period usually discourage spawning upstream of the hatchery facility. Voights Creek is a relatively small tributary to the Carbon River and is not typical fall chinook habitat. It is unlikely that significant numbers of natural fall chinook are encouraged to stray into this stream, much less the holding pond. The level of natural contribution to hatchery broodstock will be assessed when marked hatchery fish begin returning. However, that assessment may be confounded by returns resulting from hatchery-origin chinook spawning in Voights Creek below the hatchery.

Hatchery-origin fall chinook adults may also spawn in the wild with their natural-origin counterparts. Stray rates have not been assessed in the Puyallup basin because hatchery fall chinook production was not identified until the 1997 brood. Significant stray rates could effect genetic change that might reduce the natural stock's long term productivity.

Migrating hatchery program smolts may compete with natural-origin fall chinook in the river below the hatchery release site and in the estuarine areas. This competition may result in some undetermined level of mortality in the natural-origin smolts.

The Voights' Creek gravity intake structure may lead to a take of listed chinook. The fish ladder at the intake may lead to a very low level risk of take due to passage delay during low or high (most likely of the two) flow periods in September or October. The Intake screens are not compliant with State and NMFS standards and may lead to a low/moderate risk of take.

White River spring chinook:
Coded-wire-tag recoveries indicate that Voights Creek fingerling fall chinook adult production strays into the White River at some undetermined level. Currently, all adipose-marked and coded-wire-tagged chinook are removed from the natural spawning population trucked above Mud Mountain Dam. Coded-wire-tagged fish are transferred to

White River Hatchery, where all non-White River stock chinook are sacrificed at spawning. Voights Creek fall chinook production should be 100% identified so that they can be removed from the natural spawning population and the hatchery recovery program broodstock. Identification will also facilitate determination of the stray rate to the lower river spawning population and potential stock impacts that may result. Significant stray rates could effect genetic change that might reduce the natural stock's long term productivity.

Migrating hatchery program smolts may compete with natural-origin and hatchery recovery program spring chinook fingerlings in the Puyallup river below the mouth of the White River and in the estuarine areas. This competition may result in some undetermined level of mortality in the natural-origin smolts.

- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.

Unknown.

- Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

Unknown.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

Not applicable - no take levels are defined.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

None

3.3) Relationship to harvest objectives.

3.3.1) Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

Recent stock-specific tagging data are not available for Voights Creek fingerling production. However, 1999 exploitation estimates have been made for Puyallup River fall chinook harvest management planning in the Fishery Regulation Assessment Model (FRAM).

Fishery Aggregate	Predicted 1999 Exploitation Rate
Alaskan Fisheries	0.41%
Canadian Fisheries	12.38%
WA Ocean Non-treaty Troll	3.45%
WA Ocean Treaty Troll	2.96%
WA Ocean Sport	0.04%
PS Treaty Troll	1.19%
PS Non-treaty Net	0.84%
PS Sport	4.60%
PS Treaty Net	1.97%
FW Treaty Net	25.22%
FW Sport	2.75%
Total Harvest	55.81%

These figures represent expected adult equivalent fishing mortality, based on 1999 fishing regulations and estimated 1989-1993 average exploitation rates. Note that Washington fisheries account for an expected harvest of 43.02% of Puyallup fall chinook.

Without stock-specific contribution rates, estimates of absolute contribution (numbers of fish) are not possible.

Although there are no natural Puyallup River fall chinook tagging studies, hatchery rates are presumed to reasonably represent natural stock harvest patterns.

3.4) Relationship to habitat protection and recovery strategies.

Identified habitat management needs within the Puyallup basin include:

Evaluate the newly completed fish passage facility (completed in 2000) at Puget Sound Energy's Electron Diversion Dam. Evaluate the downstream migrant passage facility at Puget Sound Energy's Electron Diversion Dam Intake. Monitor instream flows in the upper Puyallup River to assure that minimum levels are met or exceeded.

Continue to restore estuarine fall chinook habitat in Commencement Bay and to identify and control sources of pollution in the lower Puyallup River and Commencement Bay.

Increase the amount of large woody debris in the watershed, maintain wooded riparian zones and enhance vegetation in damaged riparian areas.

Reduce channelization of the Puyallup River and pursue opportunities to develop levee setback projects and reconnect historic meander channels. This would include minimizing "infilling" of floodways and critical habitat with residential development in order to preserve future opportunities.

Reduce the number of logging roads in the watershed and replace culverts that currently block fish passage.

Further limit gravel removal operations in the Puyallup River.

3.5) Ecological interactions.

Program fall chinook fingerlings may provide prey for yearling and older steelhead, bull trout and cutthroat and yearling coho in the freshwater and estuarine areas. They may compete with Puyallup basin naturally produced fall and spring chinook fry in freshwater and estuarine areas. Factors limiting marine production are not clearly understood (e.g. forage species population dynamics and status, fluctuations in environmental physical parameters, marine carrying capacity, etc.), but there are likely unquantified competitive relationships between program fish and other natural fall chinook stocks within the Puget Sound ESU.

Returning adult hatchery production may stray into the Puyallup River and White River, potentially affecting the genetic composition and survival/productivity of those listed natural stocks.

Increasing pinniped populations in Puget Sound may be negatively affecting survival of this program's production.

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Voights Creek hatchery is supplied by surface water from Voights Creek. Water is withdrawn from a gravity intake approximately 1/2 mile upstream from the hatchery. Gravity water is supplemented with water pumped at the hatchery site. The gravity intake supplies 2000 gpm. The (three) pumps deliver 1,500 gpm each. Voights Creek responds quickly to heavy rainfall and is prone to rapid fluctuations. Heavy bed loads are due to landslides, timber harvest and watershed development. Winter floods are becoming a common occurrence. Late summer low flows with elevated temperatures into the high 60's have been the norm for several decades. Water withdrawals from the gravity intake

may divert a significant portion of the creek water from the area immediately below the intake. The screen box bypass channel and a tributary creek rejoin the creek several hundred yards below the intake. The fish ladder is accessible and operational even with the low flows. Natural salmon production is blocked, above RM 4, due to a series of impassable waterfalls.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Gravity intake screens are not now in compliance with code requirements for mesh size but are identified for replacement. Hatchery-origin chinook have access to the habitat above the gravity intake on some years. The pump intake is fitted with 3.5" x .125" "wedge-wire" screening. Hatchery effluent shall meet or exceed NPDES permit standards for discharge of pond cleaning waste or pond drawdown. WDFW shall repair the intake screens to the appropriate standards.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Broodstock are collected in an off-line trap situated alongside Voights Creek. The trap pond is earthen and measures approximately 30' x 250' The pond doubles as a rearing pond in the spring. Prior to 1996, adults were diverted into the trap pond by a permanent rack in Voights Creek. Since 1996 the rack has been inoperative due to gravel deposition. Returning adults enter the trap pond volitionally at this time.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

Fish hauls utilize fish tanker trucks of 500 to 2,000 gallon capacity equipped with water pumps and oxygen tanks.

5.3) Broodstock holding and spawning facilities.

Broodstock are held in a large earthen pond. Adults are seined, sorted, killed and spawned at pondside.

5.4) Incubation facilities.

Incubation utilizes 68 vertical Heath Techna incubators with the eyeing capacity of 11 million eggs and the hatching capacity of 5.5 million salmon.

5.5) Rearing facilities.

The facility utilizes 9 "standard" concrete rearing ponds, two 1/4 acre asphalt ponds and

one large earthen pond (also used to trap adults).

5.6) Acclimation/release facilities.

All station production is released through the earthen rearing / trap pond, which receives re-use inflow from the 9 standard ponds and the two 1/4 acre ponds.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

In the past 12 years:

1. Heavy debris loads cause the gravity intake screens to become plugged frequently. This, coupled with a faulty alarm unit, caused the loss of 100,000 yearling coho in November, 1999.

2. Flood conditions in February 1996 caused the suffocation loss of several hundred thousand coho sac-fry yet in the incubators. The same flood caused the premature release of an unknown number (>50K) of yearlings.

3. Occasionally, water orifices which supply individual vertical incubators will plug with debris causing the loss of complete vertical stacks of eggs or fry.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

The hatchery is equipped with a backup generator and adequate fuel supply in the event of a power outage. Two on-site personnel are on rotating standby status year around in the event of a problem. An upgraded alarm system is designed to detect changes in flow and power status. The risk of disease transmission shall be limited by using effective theraputents, as prescribed and in a timely manner.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

Adults returning to the Voights Creek facility.

6.2) Supporting information.

6.2.1) History.

Built in 1917, Voights Creek Hatchery initially procured small numbers of eggs from native fall chinook on-station. Approximately 50,000 eggs were collected annually between 1918 and 1923, with production at Voights Creek augmented through fry transfers from Green River and lower Columbia region hatcheries (Kalama River and Little White Salmon) to build up the run (WDFG, 1925). Prior to 1990, production at Voights has relied on transfers of Green River lineage fall chinook eggs (Soos Creek), and on-station returns of this transplanted stock. Since then, the hatchery has been self-sufficient. Genetic data suggests that naturally spawning populations (e.g., South Prairie Creek) are closely aligned to Green River stock (Tim Tynan, NMFS).

6.2.2) Annual size.

With a permanent rack in place, all returning adults will be captured. When the first return of totally marked contributing broods (1999 brood) returns in 2004, WDFW will have the ability to bypass adults of natural origin to spawn upstream of the hatchery.

6.2.3) Past and proposed level of natural fish in broodstock.

Unknown.

6.2.4) Genetic or ecological differences.

There are no significant differences between the genetics (given the differentiation power of current tools), basic life history strategies, return and spawning timings and adult physical characteristics between the naturally spawning Puyallup fall chinook population and the hatchery production. However, WDFW will continue to collect and analyze genetic data from the hatchery and naturally spawning population.

6.2.5) Reasons for choosing.

Locally adapted.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

At the present time we have no ability to distinguish between fall chinook of hatchery and natural origin. Mass marking will be the tool in the future.

SECTION 7. BROODSTOCK COLLECTION

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

Adults.

7.2) Collection or sampling design.

Returning adults are trapped, volitionally, in an off-creek trap. An instream weir has been in-operative since 1996. It will eventually be replaced. With a weir, trap efficiency is 98%. Without a weir, trap effeciency is 80-90%. Peak returns occur between early September and mid-October with the range from July to late October.

7.3) Identity.

Does not apply.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

555 males and 555 females: 1,110 adults

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

Year	Adults			Eggs	Juveniles
	Males	Females	Jacks		
1988	420	397	5	1,672,000	
1989	411	351	5	1,545,000	
1990	725	706	9	2,897,000	
1991	655	618	8	2,440,000	
1992	750	726	8	3,213,000	
1993	515	490	6	1,808,000	
1994	1,000	921	12	4,131,200	
1995	774	738	79	3,250,000	
1996	788	765	70	3,128,000	
1997	813	547	86	2,319,000	
1998	544	525	5	2,509,000	
1999	600	530	12	2,444,000	
2000	489	489	5	2,264,400	
2001	469	463		2,295,000	

Note: Males for 1988 to 1994 are estimated numbers spawned from total males returning for the season.

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Surplus hatchery chinook (goal of 1,000 per year) are loaded onto various tanker trucks for hauling into the upper Puyallup River (above Electron Dam). If female numbers exceed hatchery need, eggs are taken randomly from later spawning females, to represent that portion of the run, and the remaining females are "surplused", i. e., removed from the breeding pool.

7.6) Fish transportation and holding methods.

For the Upper Puyallup (above Electron Dam) fall chinook re-introduction project, randomly collected, surplus hatchery chinook are loaded onto various tanker trucks for hauling into the upper Puyallup River. Each tank is equipped with water pumps and oxygen systems. The fish are planted directly into the upper watershed at pre-selected sites where they spawn naturally.

7.7) Describe fish health maintenance and sanitation procedures applied.

Standard fish health protocols, as defined in the Co-Manager Fish Health Manual (WDFW 1996), are adhered to.

7.8) Disposition of carcasses.

Spawned carcasses are utilized for nutrient enhancement or sold to a carcass buyer for rendering into meal. Unspawned adults are either donated to local food banks or sold to the carcass buyer for processing for human consumption. Pond mortality is utilized for nutrient enhancement purposes.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

Procedures set forth in the Co-Managers Fish Health Policy and the WDFW spawning guidelines (Seidel, 1983) will be adhered to. Wild chinook will not knowingly be incorporated into the broodstock.

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

Females are chosen randomly from ripe fish. Depending upon the magnitude of the returns, the aim is to spawn all ripe females each spawn day. Males are selected randomly. Matings are 1:1. About 1% of males used are "jacks". If female numbers exceed hatchery need, eggs are taken randomly from later spawning females, to represent

that portion of the run, and the remaining females are "surplused", i. e., removed from the breeding pool.

8.2) Males.

Males are selected randomly. Matings are 1:1, but if a male killed for spawning is not fully ripe or has very little sperm, another male is used to assure fertilization of the eggs. About 1% of males used are "jacks".

8.3) Fertilization.

Matings are 1:1, but if a male killed for spawning is not fully ripe or has very little sperm, another male is used to assure fertilization of the eggs. The eggs from 1 female are collected in a bucket. The sperm from one male, or two, is expressed directly onto the eggs and mixed gently. The mix is allowed to sit for 30 to 60 seconds and then pooled in a common bucket with other eggs. They then go into the hatchery.

8.4) Cryopreserved gametes.

Not employed

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

One to one matings will be utilized to maximize the number of spawners incorporated in the gene pool. Adults will be selected, randomly from the entire run. In the future, all matings will be from marked hatchery-origin adults.

SECTION 9. INCUBATION AND REARING -

Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

Green egg to fry: range from 84.6% to 93.5% (Avg.= 91.5%)

9.1.2) Cause for, and disposition of surplus egg takes.

On occasion, a surplus of eggs results from inaccurate green egg sampling at the time of egg take. Extra eggs are normally taken as a safeguard against potential incubation loss. Surplus fry, less than or equal to 10% are normally reared as part of the programmed releases. Additional excess was commonly released as unfed fry or short-term reared fry.

In recent years, a greater emphasis has been placed on not exceeding the program release goals and, beginning with the 2000 brood, excess fry will be released only into landlocked lakes.

9.1.3) Loading densities applied during incubation.

Eggs are eyed and hatched in vertical incubators. Eggs are eyed at approximately 10,000 per tray. Eggs are hatched at a rate of 7,000 per tray with each stack receiving 3 to 4 gpm inflow.

9.1.4) Incubation conditions.

Eggs are hatched with Vexar substrate using ambient Voights Creek water. Water quality has deteriorated due to heavy silt load. Accumulated silt is flushed periodically from the trays.

9.1.5) Ponding.

Ponding occurs when the fry have achieved >95% button-up status. Ponding is forced and occurs between late December and mid-January.

9.1.6) Fish health maintenance and monitoring.

Egg fungus is controlled with a 15 minute formalin drip at 100 parts per million (ppm), 5 days per week, until the eggs are shocked and picked. Dead eggs are removed with the aid of a "Jen-sorter" power egg picker. Coagulated yolk-sac incidence level is low.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

Back-up generator is on-site to provide power for hatchery pumps in the event of power loss. Eggs in the future will be from marked hatchery-origin adults.

9.2) <u>Rearing</u>:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available..

Fry to smolt: range from 93.6% to 99.4% (Avg= 98.0%).

9.2.2) Density and loading criteria (goals and actual levels).

Loading goals conform to guidelines set out in Fish Hatchery Management (Piper, 1982). Maximum loading goals, in terms of lbs / gpm at release, equate to 1.5 x fish length in

inches. Maximum densities, in terms of lbs / cu.ft. of rearing space, equate to .3 x fish length in inches.

9.2.3) Fish rearing conditions

All ponds receive ambient water from Voights Creek. Incoming oxygen levels are saturated, but are not normally monitored. Due to heavy silt loads the ponds are vacuumed frequently (weekly or as-needed). Normal loss is vacuumed to the pollution abatement pond. Losses derived from disease epizootics are sent to a sanitary landfill.

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

Not available.

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

Not available.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Feed type is a salmon formulation of dry crumbles or pellets. Feed brand varies with the contract price. Fish are fed daily at a rate approximating 2% B.W./day. The maximum feed rate goal is approximately .1 lb. of feed per gallon per minute (gpm) inflow. Feed conversions depend upon the diet and formulation but range between .8 to 1.1: 1.

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.

Ponds are vacuumed weekly or as-needed. Fish Health Specialists make scheduled visits to check on fish health. Medications or alternate management plans derive from these checks. When emptied, all ponds are cleaned, air dried and sun-sanitized, if possible.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.

Visual cues are used to assess readiness to migrate, i. e. working screens, scale shedding, loss of parr marks.

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.

Final rearing / release pond is an earthen pond with natural feed available.

9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

All fish, in the future, under propagation will be from marked hatchery-origin adults.

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels. *(Use standardized life stage definitions by species presented in **Attachment 2**. "Location" is watershed planted (e.g. "Elwha River").)*

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling	1,600,000	80	May-June	Voights Creek
Yearling				

10.2) Specific location(s) of proposed release(s).

Stream, river, or watercourse: WRIA 10.0021

Release point: Voights Creek (RM .5), trib to RM 4 Carbon River, trib to RM 17.8 Puyallup River

Major watershed: Puyallup River

Basin or Region: Puget Sound

10.3) Actual numbers and sizes of fish released by age class through the program.

NOTE: All Voights Creek Stock unless noted otherwise.

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1988								
1989								
1990	568,000	1000 fpp	398,900 759,900	815 fpp 500 fpp	1,358,000	57 fpp		
1991			944,900	800 fpp	1,761,000	65 fpp		
1992					1,552,700	92 fpp		
1993					1,913,300	82 fpp		

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1994					1,715,600	74 fpp		
1995	660,300	995 fpp			1,699,600	76 fpp		
1996					1,748,900	95 fpp		
1997					1,504,000	95 fpp		
1998					1,597,000	64 fpp		
1999					1,794,000	70 fpp		
2000					1,724,100	71 fpp		
2001					1,611,800	67 fpp		
Average	122,830	997 fpp	210,370	700 fpp	1,664,410	77 fpp		

10.4) Actual dates of release and description of release protocols.

Prior to release and after the fingerlings have shown smolting behavior all chinook are transferred, via the hatchery pond drains, into the large earthen adult trap / juvenile rearing pond. From there the fish are allowed to volitionally exit the pond. The fish are fed until the numbers are too small to warrant further feeding. The final fish are allowed to exit volitionally but are not fed. Fish released from mid-May to early June.

RELEASE DATES:

Release Year	Life Stage	Release Date Range
1995	fingerlings	6/1/95-6/10/95
	fry	1/22/ - 3/10/95
1996	fingerlings	6/1/96-6/1/96
1997	fingerlings	5/22/97-6/1/97
1998	fingerlings	5/26/98-6/5/98
1999	fingerlings	5/20/99-6/1/99

10.5) Fish transportation procedures, if applicable.

Not applicable.

10.6) Acclimation procedures.

Fish are reared entirely on Voights Creek water..

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

All fish are currently being mass marked with an adipose fin clip.

WDFW will apply coded-wire tags to a portion of the sub-yearling fall chinook production at the Puyallup Hatchery to allow for evaluation of fishery contribution, survival rates and straying levels to other Puget Sound watersheds.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

In the past, significant numbers of surplus fish were not reared full term, but were planted as fry. In the future, egg takes will be carefully managed to minimize the likelihood of surplus eggs or fry and, beginning with the 2000 brood, excess fry will be released only into landlocked lakes.

10.9) Fish health certification procedures applied pre-release.

Routine fish health inspection by the Area Fish Health Specialist.

10.10) Emergency release procedures in response to flooding or water system failure.

Depending upon circumstances, release fish with either the highest probability of surviving to adulthood or the fish with the highest probability of sustaining catastrophic loss if held at the hatchery.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

To minimize the risk of residualization and impact upon natural fish, hatchery fingerlings are released in late May or early June as fingerling smolts. Release is volitional with the final "few" fish force released. All fish to be released are 100% marked.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

Note: See section 1.10 for Monitoring and Evaluation. The purpose of a monitoring program is to identify and evaluate the benefits and risks which may derive from the hatchery program. The monitoring program is designed to answer questions of whether the hatchery is providing the benefits intended, while also minimizing or eliminating the risks inherent in the program. A key tool in any monitoring program is having a mechanism to identify each hatchery production group.

Each production group shall be identified with distinct otolith marks, adipose clips, coded wire tags, blank wire tags or other identification methods as they become available, to

allow for evaluation of each particular rearing and/or release strategy. This will allow for selective harvest on hatchery stocks when appropriate, monitoring of interactions of hatchery and wild fish wherever they co-mingle in riverine, estuarine and marine habitats and assessment of the status of the target population. WDFW shall monitor the Chinook salmon escapement into the target and non-target Chinook populations to estimate the number of tagged, un-tagged and marked fish escaping into the river each year and the stray rates of hatchery Chinook into the rivers.

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

WDFW mass marks 100% of the fingerling chinook release to allow for monitoring and evaluation of chinook escapement to the Puyallup River. This marking will assist in the monitoring of the NOR/HOR spawning ground ratios and assessment of the status of the target population.

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

Funding and resources are currently committed to monitor and evaluate this program as detailed in the Resource Management Plan for Puget Sound Chinook Salmon Hatcheries (Washington Department of Fish and Wildlife and Puget Sound Treaty Tribes, August 23, 2002).

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

Monitoring and evaluation will be undertaken in a manner which does not result in an unauthorized take of listed chinook.

SECTION 12. RESEARCH

12.1) Objective or purpose.

Evaluate efficacy of introducing surplus adult fall chinook salmon into the Puyallup River watershed above Electron Dam:

Surplus chinook salmon (goal of 1,000 per year) from the Voights Creek Hatchery were chosen, in brood year 1999, as the "most suitable local source" of chinook to re-introduce into the upper Puyallup watershed; barren of salmon since 1903 (due to Electron Dam). In 2000, the Puyallup Tribe initiated a smolt trapping program to measure wild chinook smolt production and hatchery chinook smolt survival through out-migration.

12.2) Cooperating and funding agencies.

Lead: Puyallup Tribe (effective 2001)

12.3) Principle investigator or project supervisor and staff.

Chris Phinney, Puyallup Tribe

Blake Smith, Puyallup Tribe

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

A screw tap is operated in the Puyallup River immediately upstream of the confluence with the White River. Chinook smolts are enumerated and inspected for marks and tags. Total out-migration is estimated for all stocks encountered. Fish are anaesthetized with MS-222 while being mark, tag and length sampled.

Routine stream surveys by Tribe. Downstream migrant trap at Electron Dam: Tribe.

12.6) Dates or time period in which research activity occurs.

Trapping begins in March and continues into August.

Fall season

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

Fish are held until they are fully recovered from the anaesthetic and then are released downstream of the trap. The fish in the trap are processed a minimum of two times daily, in order to minimize the holding time in the trap.

Adults transported in WDFW fish tanker trucks to release sites.

12.8) Expected type and effects of take and potential for injury or mortality.

At the screw trap it is expected to "take" 20,000 smolts with an estimated potential mortality of 100 (information from FMEP for Puget Sound).

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).

See section 12.8.

12.10) Alternative methods to achieve project objectives.

None.

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

Chum, coho, steelhead and pink salmon; cutthroat trout. Mortality numbers unknown.

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

Fish are held until they are fully recovered from the anaesthetic and then are released downstream of the trap. The fish in the trap are processed a minimum of two times daily, in order to minimize the holding time in the trap.

SECTION 13. ATTACHMENTS AND CITATIONS

Piper, Robert, et. al., 1982, Fish Hatchery Management; United States Dept of Interior, Fish and Wildlife Service, Washington, DC.

Washinton Department of Fish and Wildlife. 1996. Fish Health Manual. Hatcheries Program, Fish Health Division, Washington Department of Fish and Wildlife, Olympia.

Seidel, Paul, 1983, Spawning Guidelines for Washington Department of Fish and Wildlife Hatcheries, Washington Department of Fish and Wildlife, Olympia.

Washington Department of Fish and Wildlife, Hatchery Operation Plan and Performance Summaries, 1995.

Washington Department of Fish and Game (WDFG). 1925. Annual Report for 1923-1924. Washington Department of Fish and Game. Seattle, Wa.

Washington Department of Fish and Wildlife and Puget Sound Treaty Tribes, 2002, "Puget Sound Chinook Salmon Hatcheries, Resource Management Plan", a component of Comprehensive Chinook Salmon Management Plan, August 23, 2002. 103 pages.

SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

Table 1. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Chinook ESU/Population: Puget Sound Activity: Hatchery Fingerling Production				
Location of hatchery activity: Voights Creek Dates of activity: June - May Hatchery program operator: WDFW				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)			Unknown	
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)			Unknown	
Unintentional lethal take g)	Unknown	Unknown		
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.